



TECHNICAL INFORMATION SHEET 43

GAS CYLINDER FILLING - AUDIT

Background

The safe filling of gas cylinders is a complex activity. Filling has to be carried out at specially equipped centres, with qualified staff using appropriate procedures. The British Compressed Gases Association (BCGA) has developed this audit checklist for use when assessing a filling centre to ensure compliance with Regulations and industry best practice (refer to Appendix 1).

Specific information on the filling of gas cylinders is available in:

- BCGA CP 32 [10], *The safe filling of beverage gas cylinders.*
- BCGA CP 43 [12], *The safe filling of gas cylinders.*

References:

- 1) Weights and Measures Act 1985
- 2) SI 1991. No. 2825, The Food Premises (Registration) Regulations 1991.
- 3) SI 1998. No. 2306, The Provision and Use of Work Equipment Regulations (PUWER).
- 4) SI 2000. No. 128, The Pressure Systems Safety Regulations (PSSR) 2000.
- 5) SI 2002. No. 2776, The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR).
- 6) SI 2016. No. 1107, The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016.
- 7) ECE/TRANS/257, European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) (as amended).
- 8) EC No. 1272/2008, Classification, Labelling and Packaging of Substances and Mixtures (CLP) (as amended).
- 9) ISO 18119, *Gas cylinders. Seamless steel and seamless aluminium-alloy gas cylinders and tubes. Periodic inspection and testing.*
- 10) BCGA CP 32, *The safe filling of beverage gas cylinders.*
- 11) BCGA CP 39, *In-service requirements for pressure equipment (gas storage and gas distribution systems).*
- 12) BCGA CP 43, *The safe filling of gas cylinders.*
- 13) BCGA GN 23, *Gas safety. Information, instruction and training.*
- 14) BCGA TIS 6, *Gas cylinder identification. Label and colour code requirements.*

For more information:

UK Legislation

www.legislation.gov.uk

British Standards Institute (BSI)

www.bsigroup.co.uk

British Compressed Gases Association (BCGA)

www.bcgga.co.uk

Medicines & Healthcare products Regulatory Agency (MHRA)

www.mhra.gov.uk

AUDIT CHECKLIST

COMPANY:
PREMISES AUDITED:
AUDITOR:
DATE OF AUDIT:
BRIEF DESCRIPTION OF PREMISES AND PRODUCTS FILLED: <i>Auditors note. Include comment on suitability of plant, premises and general condition.</i>

NOTE: In the following tables, the scoring “C” refers to critical and “S” refers to supporting.

TABLE 1 - RECORDS		
1.1	List names of people interviewed during audit, their job title qualifications and experience.	Scoring:- N/A.
1.2	Is there a recognised and documented Quality Management System (QMS) in place which includes the filling of gas cylinders?	Mandatory requirement. Scoring:- 1 = Full compliance, all records complete and available. 2C = Occasional gaps in records but evidence of a QMS in place. 3C = No evidence of a QMS.
1.3	When filling cylinders with a medical gas is a Manufacturers' Authorisation held for each medical gas? The Manufacturers' Authorisation is issued by the Medicines and Healthcare products Regulatory Agency (MHRA).	Mandatory regulatory requirement. Scoring:- 1 = Full compliance, all records complete and available. 3C = No evidence of any records.
1.4	When filling cylinders with a food gas is the premises registered with the Local Authority? Refer to The Food Premises (Registration) Regulations [2].	Mandatory regulatory requirement. Scoring:- 1 = Full compliance, all records complete and available. 3C = No evidence of any records.
1.5	For cylinders owned by the company check a specimen sample of records to establish: <ul style="list-style-type: none"> • the specification they were purchased to • the adequacy of the original certification • their compliance with UK Regulations 	If no certification available and no other means of establishing ownership and technical suitability of the container for service then the application shall be rejected. Scoring:- 1 = Full compliance, all records complete and specifications adequate. 2C = Occasional gaps in records but evidence of a system in place. 3C = No system in place and evidence that cylinders are not purchased to adequate requirements.

1.6	<p>Are 3rd party cylinders ever filled?</p> <p>If so, are additional checks carried out to ensure these are safe to fill and that they have the owners' authority to fill?</p>	<p>If 3rd party cylinders are filled.</p> <p>Scoring:-</p> <p>1 = Full compliance, all records complete, safety checks carried out, owners authority obtained.</p> <p>2C = Occasional gaps in records but evidence of a system in place.</p> <p>3C = No system in place and evidence that cylinders are not checked.</p>
1.7	<p>Are there standard and emergency operating procedures for all activities associated with cylinder filling?</p> <p>Check:</p> <ul style="list-style-type: none"> • are they current • are they comprehensive • are they available • are they used 	<p>Standard and emergency operating procedures to be available and known to operators. If there is no formal system of work then this is a valid reason for rejection of the application.</p> <p>Scoring:-</p> <p>1 = Full compliance, all procedures, adequate, and available.</p> <p>2C = Occasional gaps in the system, e.g. occasional procedures not available but evidence of a system in place.</p> <p>3C = No formal procedures</p>
1.8	<p>Are there standard operating procedures to control and document cylinder service conversions?</p> <p>Check authority required for this process and establish competency.</p>	<p>If in-service conversions are undertaken in house:</p> <ol style="list-style-type: none"> 1. Look in detail at understanding of developed pressures and material compatibilities. 2. Look for formal approval and control by a competent person and understanding of when a Notified Body may be required. <p>When applicable, then failure to operate an adequate system of control can be taken as a valid reason for rejection.</p> <p>Scoring:-</p> <p>1 = System in place, full compliance with requirements and formal authorisation of conversions by a competent person.</p> <p>2C = Occasional gaps in records but system in place and competent person available.</p> <p>3C = No system in place and evidence of service conversions undertaken without authorisation and review.</p>
1.9	<p>Are filling records maintained? Is record keeping included and in accordance with the QMS? Do they detail:</p> <ul style="list-style-type: none"> • products filled • date of fill • batch / lot identification • quality control results 	<p>Absence of filling records on its own cannot be a reason for rejection but may be a contributory factor.</p> <p>Scoring:-</p> <p>1 = Full compliance, all records complete and available.</p> <p>2S = Occasional gaps in system but evidence of a system in place.</p> <p>3S = No records maintained.</p>

TABLE 2 - PLANT AND EQUIPMENT – Inspection, maintenance & examination		
2.1	<p>Is the equipment used to carry out the filling of gas cylinders correctly designed, installed and commissioned?</p> <p>Check the equipment is suitable for the gases and the types of cylinders being filled.</p> <p>Check the physical condition of the plant and equipment used to fill cylinders.</p>	<p>The auditor will have to use his judgment and experience to assess the suitability and physical condition of the plant in relation to its required duties. Obvious safety risks or inadequate equipment may be contributory factors to rejection but cannot on their own be the only reason as there are limited objective criteria. Check that the equipment looks to be capable of producing product to the applicant's specification.</p> <p>Scoring:-</p> <p>1 = Full compliance, plant is suitable for use and in good condition.</p> <p>2C = Occasional gaps in system, e.g. plant old and some areas not well maintained, but evidence of general capability of plant to produce range of products offered.</p> <p>3C = Plant in very poor condition or incapable of producing the range of products offered.</p>
2.2	<p>Are formal inspection and maintenance schedules in place for filling equipment and associated test and measurement equipment?</p> <p>Are formal records kept of the above activities?</p> <p>Refer to:</p> <ul style="list-style-type: none"> • PUWER [3] • BCGA CP 39 [11] 	<p>Formal inspection and maintenance shall be evident e.g. flexible hose and connectors' examination.</p> <p>Scoring:-</p> <p>1 = Full compliance, all records complete and available, evidence of satisfactory maintenance of plant and equipment.</p> <p>2C = Occasional gaps in system e.g. occasional record missing but evidence of a system in place.</p> <p>3C = No evidence of any system of preventive maintenance.</p>
2.3	<p>Is an examination carried out in compliance with the PSSR [4]?</p> <p>Is there a current Written Scheme of Examination (WSE)?</p> <p>Are formal records kept of the above activities?</p> <p>Refer to BCGA CP 39 [11]</p>	<p>A WSE shall be available. Lack of a WSE would be a valid reason for rejection of application.</p> <p>Scoring:-</p> <p>1 = Full compliance, all records complete and a WSE available.</p> <p>2C = Occasional gaps in system but evidence of a system in place.</p> <p>3C = No evidence of any system of compliance with PSSR [4], no WSE.</p>

2.4	<p>Is a suitable and sufficient risk assessment carried out in accordance with DSEAR [5]?</p> <p>As required, does equipment comply with the EPS Regulations [6]?</p>	<p>Where a flammable or explosive atmosphere exists a DSEAR [5] risk assessment shall be in place. Lack of a DSEAR [5] risk assessment and adequate control measures would be a valid reason for rejection of application.</p> <p>Scoring:-</p> <p>1 = Full compliance, DSEAR [5] risk assessment carried out and control measures implemented.</p> <p>2C = Occasional gaps in system but evidence of a system in place.</p> <p>3C = No evidence of any system of compliance with DSEAR [5].</p>
2.5	<p>Is test and measurement equipment, including weighing equipment, included in a formal calibration system?</p> <p>Is the management of test and measurement equipment, including their calibration, included in the QMS?</p> <p>Are calibrated items marked accordingly?</p> <p>Are formal records kept, including Certification? Check records of such calibration.</p>	<p>Where products are filled or sold by weight compliance is required with the <i>Weights and Measures Act</i> [1] (crown stamping of scales) and a formal calibration system shall be in place.</p> <p>Where lack of calibration control presents a risk to Health and Safety then this may be regarded as a valid reason for rejection of application.</p> <p>Scoring:-</p> <p>1 = Full compliance, all records complete and available.</p> <p>2C = Occasional gaps in system e.g. calibration label missing but evidence of a system in place.</p> <p>3C = No evidence of any system of calibration control.</p>
2.6	<p>Has a personal protective equipment (PPE) risk assessment been carried out?</p> <p>Are personnel provided with the appropriate PPE?</p> <p>Is PPE in a good condition?</p> <p>Is PPE used?</p>	<p>Scoring:-</p> <p>1 = Full compliance, PPE risk assessment carried out and control measures implemented.</p> <p>2C = Occasional gaps in system but evidence of a system in place.</p> <p>3C = No evidence of any PPE issued.</p>

TABLE 3 - PREFILL OPERATIONS		
3.1	Are there formal pre-fill standard operating procedures that clearly lay down acceptability criteria?	<p>If not then application to be rejected.</p> <p>Scoring:-</p> <p>1 = Full compliance, procedure in place.</p> <p>2C = Occasional gaps in system but evidence of a system in place.</p> <p>3C = No evidence of any system of pre-fill inspection or general non-compliance with the system in place.</p>
3.2	Do standard operating procedures ensure that only cylinders complying with an appropriate design standard are filled?	<p>Look for recognised and approved design standard stamped on the cylinder.</p> <p>Scoring:-</p> <p>1 = Full compliance, cylinder fillers are aware of checks required and cylinder stampings are looked at. System in place for cylinder control.</p> <p>2S = Occasional gaps in system but evidence of a system in place.</p> <p>3S = No evidence of any system for ensuring the design standards of cylinders filled are adequate.</p>
3.3	Do standard operating procedures ensure that cylinders with no residual pressure, or that may have been left with their valves open, are inspected internally to ensure their suitability for filling?	<p>If no precautions taken then application to be rejected.</p> <p>Scoring:-</p> <p>1 = Full compliance, methods in place to ensure that cylinders with suspect contamination are not filled.</p> <p>2S = Occasional gaps in system but evidence of a system in place.</p> <p>3S = No evidence of any system or evidence of general non-compliance with the system.</p>
3.4	Where residual pressure devices are fitted to valves, is there an adequate method for ensuring that the devices function correctly?	<p>Scoring:-</p> <p>1 = Full compliance, functionality checked each fill.</p> <p>2S = Occasional gaps in system e.g. some valves not checked but evidence of a system in place.</p> <p>3S = No evidence of any system or evidence of general non-compliance with the system.</p>

3.5	<p>Do the standard operating procedures require that cylinders to be filled have valid test status?</p> <p>Do standard operating procedures identify how to check the test status?</p>	<p>Scoring:-</p> <p>1 = Full compliance with procedures in place to ensure that cylinders filled are within current test periods.</p> <p>2C = Very isolated lapses in system but evidence of a system in place and corrective actions to address any lapses in the system.</p> <p>3C = No evidence of any system for ensuring that cylinders filled are within test or evidence of general non-compliance with the system.</p>
3.6	<p>Are standard operating procedures in place for managing cylinders that are outside of the test date?</p>	<p>Scoring:-</p> <p>1 = Full compliance with procedures in place.</p> <p>2C = Occasional gaps in system but evidence of a system in place.</p> <p>3C = No evidence of any system for control of cylinders outside test date or evidence of general non-compliance with the system.</p>
3.7	<p>Check the process used for cylinder inspection and test, by whom and to what standard. Is this included in the QMS?</p> <p>e.g. BS EN ISO 18119 [9].</p>	<p>Scoring:-</p> <p>1 = Full compliance, UK Competent Authority approved cylinder test house working to approved standards</p> <p>3C = Evidence that cylinders are either not retested to an approved standard or that the tests done are inadequate.</p>
3.8	<p>Check how the next test date is identified on the cylinders?</p>	<p>Scoring:-</p> <p>1 = Full compliance, permanent stamps and test date rings used.</p> <p>2C = Not all cylinders are clearly stamped and no test date rings.</p> <p>3C = No evidence of any method of identifying next test due date or the last test date.</p>
3.9	<p>Is ownership of cylinders established when presented for filling?</p> <p>Has the owner given authority for the cylinders to be filled?</p>	<p>Scoring:-</p> <p>1 = Full compliance, all cylinders presented for filling are owned by the company or, if customer owned, there is evidence that ownership is established prior to fill and that filling is approved by the owner.</p> <p>2S = Occasional gaps in system but evidence of a system in place.</p> <p>3S = No evidence of any system of establishing ownership.</p>

3.10	<p>Check that the cylinders to be filled are suitably rated for the product to be filled.</p>	<p>Scoring:-</p> <p>1 = Full compliance with a formal system for ensuring that the cylinders filled are suitable for the product, mix and filling pressure.</p> <p>3C = Evidence that cylinders are being filled that are not suitable for the pressure or the products being filled.</p>
3.11	<p>Are cylinder valves fitted which are compatible and appropriate for the gas the cylinders (will) contain, including an appropriate valve outlet?</p>	<p>Scoring:-</p> <p>1 = Full compliance, cylinders fitted with correct valves and outlets.</p> <p>3S = Evidence of incorrect valves or outlets.</p>
3.12	<p>Are cylinders identified for the gas they (will) contain using an appropriate colour scheme?</p> <p>Mandatory for acetylene = Maroon.</p> <p>Mandatory for medical gases.</p> <p>Refer to BCGA TIS 6 [14]</p> <p>(For labels – refer to Section 5.2)</p>	<p>Scoring:-</p> <p>1 = Full compliance, cylinder colour correct.</p> <p>3C = Evidence that acetylene / medical gas cylinders have the incorrect colour(s).</p> <p>3S = Evidence of incorrect colour(s) used on cylinders for other gases.</p>

TABLE 4 - FILL OPERATIONS

4.1	<p>Are the filling methods and procedures employed suitable to ensure that the integrity of the cylinders filled is not adversely affected?</p>	<p>If a standard manometric (pressure measurement) system is used for mixtures greater than 30 % CO₂, consider the filling pressures and the technical feasibility of the filling system. If in doubt seek further guidance, but application may be rejected if the filling process is technically not capable of safely producing the products offered.</p> <p>Where auto cut off systems are used look for the checks on the system operation.</p> <p>Scoring:-</p> <p>1 = Full compliance, methods suitable and procedures in place.</p> <p>2C = Occasional gaps in system but evidence of a system in place.</p> <p>3C = No evidence of any procedures to ensure that cylinder integrity is not adversely affected by the filling method or evidence that the filling methods are unsuitable for the products filled.</p>
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TABLE 5 - POST-FILL OPERATIONS		
5.1	<p>Are there standard operating procedures in place for the post-filling inspection of cylinders? To include:</p> <ul style="list-style-type: none"> • compliance with the specification • settling times • leak-checking • checking for over-filling <p>Are there standard operating procedures in place to manage cylinders which are incorrectly filled?</p>	<p>Absence of a post-fill check shall be considered by the auditor as contributing towards rejection.</p> <p>Scoring:-</p> <p>1 = Full compliance, post fill checks always done.</p> <p>2S = Occasional gaps in system, e.g. occasional check missing, but evidence of a system in place and resources to comply with it are available.</p> <p>3S = No evidence of any post fill inspection.</p>
5.2	<p>Are cylinders fitted with the correct product identification and safety labels?</p>	<p>Scoring:-</p> <p>1 = Full compliance, cylinders labeled with correct details.</p> <p>2S = Occasional gaps in system, occasional labels missed, but with evidence of a system in place.</p> <p>3S = General absence of labels.</p>

TABLE 6 - TRAINING		
6.1	<p>Check a sample of training records to establish what standard exists with regard to cylinder filling activities.</p> <p>Is there an induction training program for new personnel, including casual staff?</p> <p>Is there a system to decide when a person becomes competent in their role?</p> <p>Is there a system to periodically recheck that employees remain competent in key filling and testing activities?</p> <p>Refer to BCGA GN 23 [13]</p>	<p>No evidence that training has taken place, or records held (required if > 5 employees), may be a reason for rejection.</p> <p>CAUTION: This is a management function and will vary from applicant to applicant.</p> <p>Specifically check competency of casual staff.</p> <p>Scoring:-</p> <p>1 = Full compliance, a comprehensive training system is in place and training records are available.</p> <p>2C = Occasional gaps in system but clear evidence of a system in place.</p> <p>3C = No evidence of a training system and maintenance of training records, or evidence of general non-compliance with the system.</p>
6.2	<p>From discussion with randomly selected operations staff, is there evidence to indicate that the actual level of knowledge is sufficient for the operations being undertaken?</p>	<p>The auditor should select staff himself at random and assess the understanding of the staff.</p> <p>Scoring:-</p> <p>1 = Full compliance, a wide range of staff understand their tasks.</p> <p>2C = A few gaps in knowledge, but most have a good level of knowledge of what they are doing.</p> <p>3C = Many staff have poor understanding of the tasks they are supposed to do.</p>
6.3	<p>Are standard and emergency operating procedures made available and complied with?</p>	<p>If the operators are unaware of the standard and emergency operating procedures then the auditor needs to establish how operators are trained and what procedures apply. If there is no formal system of work then this is a valid reason for rejection of the application.</p> <p>Scoring:-</p> <p>1 = Full compliance, all instructions, adequate, and available.</p> <p>2C = Occasional gaps in the system, e.g. occasional work instruction not available but evidence of a system in place.</p> <p>3C = No formal instructions.</p>

SAMPLE CYLINDER CHECK						
<p>Select a suitable number of cylinders (minimum of three), at random, and confirm compliance with this Table. Use additional sheets, as required. Details of any non-conformance to be recorded as an appendix to the report.</p> <p>If a non-conformance is found then check at least five further cylinders. All non-conformances to be reviewed with the applicant and recorded in a separate Appendix. More than one non-conformance from any of following means rejection of the application but the auditor shall satisfy himself by inspection that this is not just an isolated instance but is indicative of the general operations.</p>						
	ATTRIBUTE ✓ = compliant X = not compliant	CYLINDER REFERENCES				
		1.	2.	3.	4.	5.
7.1	Check the external condition of the cylinder, valve and accessories to ensure that they are in a serviceable condition for filling and future use.					
7.2	Check cylinders are fitted with valves that are suitable for the gas, with appropriate valve outlets. As appropriate, check residual pressure devices.					
7.3	Check cylinders have permanent (stamping) identification markings (on the shoulder) and they are legible, in accordance with the requirements of the ADR [7].					
7.4	Check cylinders are labeled with the product they contain in accordance with the requirements of the ADR [7] and, as appropriate, CLP [8].					
7.5	Check that cylinders are only being filled when they are within their inspection and test period.					
7.6	Check cylinders carry some means of identifying the next due inspection and test.					
7.7	Check cylinders have an appropriate colour code, refer to BCGA TIS 6 [14].					

TABLE 8 - CONCLUSIONS			
<u>Question Reference</u>	<u>Critical check</u>	<u>Score</u>	<u>Comments</u>
1.1		N/A	
1.2	Yes		
1.3	Yes		
1.4	Yes		
1.5	Yes		
1.6	Yes		
1.7	Yes		
1.8	Yes		
1.9			
2.1	Yes		
2.2	Yes		
2.3	Yes		
2.4	Yes		
2.5	Yes		
2.6	Yes		
3.1	Yes		
3.2			
3.3			
3.4			
3.5	Yes		
3.6	Yes		
3.7	Yes		
3.8	Yes		
3.9			
3.10	Yes		
3.11			
3.12			
4.1	Yes		
5.1			
5.2			
6.1	Yes		
6.2	Yes		
6.3	Yes		

<i>Score:</i>		
TOTAL 3C		<i>Any score above zero here means rejection.</i>
TOTAL 2C		<i>If there are more than 3 x 2C then reject If less, divide this score by 3 and add to total below.</i>
TOTAL 3S		<i>Add this score to total below.</i>
Add: $3S + \frac{1}{3} 2C$		<i>Total of 3S & a third of 2C – if 3 or above then rejection.</i>
<i>Auditors conclusions</i>		